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EXAMINER	
CHANG, AUDREY Y	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 12/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/784,800	GORDON ET AL.	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 October 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7,9-14,16-24 and 26-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7,9-14 and 16-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Remark

- This Office is also in response to applicant's amendment filed on October 5, 2004, which has been entered into the file.
- By this amendment, the applicant has amended claims 7, 9, 12, 17-19, 21, 26 and 29, and has canceled claim 8. .
- Claims 7, 9-14, 16-24, and 26-30 remain pending in this application.
- The rejection of claims 7-14, 16-24 and 26-30 are rejected under 35 U.S.C. 112, first paragraph, due to *newly added matters* set forth in the previous Office Action is withdrawn in response to applicant's amendment.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. **Claims 7-14, 16-24 and 26-30 are rejected under 35 U.S.C. 112, first paragraph**, as containing subject matter which was not described in the specification in such a way as to **enable** one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The reasons for rejection were set forth in the previous Office Action.

The specification *discloses* only the spectrum for normal incident (angle of incidence at zero) of the light with "***exposure wavelength***", (please see Figure 5). It is therefore not clear how can one deduce the maximum transmission for a *non-normal incidence*, as recited in claims 7 and 26. It is also not clear

how to deduce from the spectrum that the "peak transmission for normal incidence located between approximately one nanometer and approximately twenty nanometer above the **exposure** wavelength". The phrase is not even making any sense. It is known in the art that by changing the optical thickness of the film and by changing the incident angle of the incident light, the resonance condition or constructive interference condition of the ***film*** will be changed, such that the peak position which corresponding to maximum transmission of **the certain wavelengths (peak positions)** of the light will be changed. In that respect, only when one uses exposing light with that certain wavelengths is capable of creating maximum transmission. These certain wavelengths are understandable to be the "**exposure wavelength**". It is therefore not clear how can one make such measurement to determine "the peak transmission for normal incidence located between approximately one nanometer and approximately twenty nanometer above the **exposure** wavelength".

Claims 9-16, 18-25 and 27-30 inherit the rejection from their respective based claim.

Claim Objections

3. **Claims 7, 9-14, 16-24, and 26-30 are objected to because of the following informalities:**

(1). The phrase "the resolution of the projected image" recited in *amended* claims 7, and 17, and the phrase "the resolution of the image projected on the surface" recited in *amended* claim 26 are confusing and indefinite since it is not clear what is this projected image. Claim 7 seems to suggest the image is any arbitrary image, claim 17 seems to suggest the image is the *opening*, claim 26 seems to suggest the image could be any image but also with "spatial information" of the opening. It is really confusing what image is referred here.

(2). The phrase "the resolution of the projected image defined at least in part by spatial information contained within light diffracted by the opening" recited in *amended* claim 7, the phase "the resolution of the projected image defined at least in part by spatial information contained within a portion of the off-axis light diffracted by the opening" recited in *amended* claim 17, and the phrase "the

resolution of the image projected on the surface being defined at least in part by the projected spatial information" recited in *amended* claim 26 are completely confusing and indefinite since it is not clear what is this **spatial information** and how can the resolution be defined by the spatial information. This makes the scopes of the claims unclear. For the purpose of examination the examiner takes that for any *opening*, with a size relevant to the wavelength to the light, the light passes through the opening will **always** be diffracted and the diffraction of the light gives a limit of resolution to the image formed through the opening. This is based on the diffraction theory and known in the art as **Raleigh's criterion**. Namely if the angular separation between two points are greater than 1.22(L/d), with L being the wavelength and d being the size of the opening the tow points can be resolved. The resolution of an projected image therefore is **implicitly** defined at least in part by the size or spatial information of the opening of the photomask.

(3). The phrase "the thin film including an *associated* peak in transmission for normal incidence light" recited in claims 9, 12, 19, 21, and 29 is wrong and confusing. The thin film is just a piece *physical film* it does not and can not include an associated peak in transmission. Transmission peak is a maximum transmission of LIGHT through the film, it is property of light not film. Also it is not understandable how could the thin film having thickness that gives peak transmission for off axis or non-normal incident light but is able to give peak transmission for wavelength that is *1 nanometer* above the "exposure wavelength". It is impossible to have this kind of accuracy for light having wavelength differing only in one nanometer to give so different transmission property.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 7-14, 16-24 and 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Nose et al (PN. 5,742,386) in view of the patent issued to Fukumitsu et al (PN. 4,657,805).

Nose et al teaches an *exposure system* for detecting foreign matter that is comprised of a *pellicle* (50), that is comprised of a *thin film*, fixed to a *pellicle frame* (51), made of *aluminum*, in order to cover a *pattern* portion on a *photomask* (52), (please see Figures 1 and 6, column 1, lines 44-54 and column 4). Nose et al teaches that the pellicle with the thin film, having certain optical thickness, is capable of making the peaks of transmission of the light with incident angles at ***off axis*** (such as 10^0, 30^0, 60^0 as shown in Figure 7) to be at *100 percent, (please see the 100 percent transmission of the off-axis light in Figures 7 and 8).* This pellicle with thin film therefore is capable of *maximizing* the transmission of light at **off axis** at an exposure wavelength.

Claims 7, 17 and 26 have further been amended to include the features of "the thin film formed to cooperate with a photomask including an *opening* and facilitate projection of an image including spatial information associated with the opening from the photomask unto a surface" wherein " the resolution of the projected image defined at least in part by spatial information contained within the light diffracted by the opening o r by the projected spatial information". As stated in the paragraphs above, Nose et al teaches that the pellicle (50) is formed to *cooperate* with a *photomask* (52) as shown in

Figures 1 and 3). Nose et al further teaches the *photomask with the protective pellicle* is used in *a semiconductor device manufacturing apparatus*, (please see Figure 9) wherein the image information, such as **IC pattern**, (please see column 1, line 49 and column 2, line 24, the explicitly teaching of IC pattern on the photomask) or **reticle pattern** (108, Figure 9) **placed** on the photomask is transferred onto a *wafer* (1110). It is **implicitly** true that the photomask has "opening" and has spatial information, i.e. physical pattern, that is transferred to the wafer to manufacture the semiconductor device, (please see Figure 9, column 1 lines 13-21 and column 7, lines 7-31). The IC or integrated circuit pattern MUST have openings otherwise no electric circuit will be created. Also by nature of the "photomask", a photomask MUST have an opening otherwise no light will be passing through the photomask. The opening associated with the IC pattern or the reticle pattern on the photomask cooperates to produce and define the image of the pattern being formed on the wafer and **according to the Rayleigh's criterion**, (explained in paragraph above) the size of the opening **implicitly** determines at least partially the resolution of the projected image.

With regard to the features concerning the thin film produces a peak in transmission for normal incidence at a wavelength between one nanometer to twenty nanometer above the exposure wavelength, since the "exposure wavelength" is arbitrary defined in the incident application, the condition is implicitly met by identifying the exposure wavelength to always meet with the condition. The specification also fails to disclose how could such peak transmission property be deduced. Such feature therefore cannot be fully considered.

Claims 7, 18 and 26 have been amended to include the feature such that the optical thickness of the pellicle film operable to maximize transmission of an exposure wavelength at an angle of incidence greater than zero, and the thickness being equal to *one-quarter or less than one quarter of the exposure wavelength* plus a design thickness for the design thickness being the thickness of the film allows to produce a transmission peak for normal incidence.

Nose et al teaches that the pellicle film, with definite thickness, enables the incident light with exposure wavelength to achieve transmittance peaks (100 percent transmittance) for incident angle *greater than zero*, (please see Figures 7 and 8). Nose et al further teaches that by varying the optical thickness of the pellicle film the maximized transmittance of the light of an exposure wavelength can be achieved at **different** incident angles greater than zero as shown in Figure 7. Although this reference does not teach **explicitly** that the film thickness is equal to one-quarter or less than one quarter of the exposure wavelength plus a design thickness for the design thickness being the thickness of the film allows to produce a transmission peak for normal incidence, but such feature is **implicitly** met for the reasons state as follows. It is known in the art that the maximum transmittance of the pellicle film for normal incident is determined by the equation: $m * \lambda = (2 * n) * d$, with m being an integer, λ being the exposure wavelength, n being the refractive index of the pellicle film and d being the thickness of the film. It can be easily calculated that for n =1.5 and the exposure wavelength being 0.488 μm the design thickness d for normal incidence is 0.813 μm, which means the actual thickness 0.86 μm is being greater than the design thickness by less than one quarter of the exposure wavelength, (one quarter of the exposure wavelength is 0.122 μm). **One skilled in the art** would understand that the maximum or peak transmission of the light is determined by the *interference theory*. By teaching the peak transmission occurs at incident angle *greater than zero or non-normal incident angle*, according to the interference theory, the thickness of the film taught by **Nose must be different** from the thickness of the film that gives peak transmission at normal incident angle. In order for the peak transmission, (for non-normal incident angle) to be **at the same exposure wavelength** as for normal incident, the thickness of the film has to be varied from the thickness for normal incident. It is a simple mathematical calculation and one skilled in the art would understand such.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the pellicle film is an amorphous fluoropolymers. **Fukumitsu** et al in the same field of

endeavor teaches a thin film pellicle for a photomask wherein the thin film is made of amorphous fluoropolymers that has a good transmittance in the ultraviolet and visible wavelength ranges, (please see the abstract). It would then have been obvious to one skilled in the art to apply the teachings of Fukumitsu et al to make the thin film pellicle of Nose et al with amorphous fluoropolymers for the benefit of using a suitable material that has good transmittance property to make the pellicle. Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claims 10-14, 20-24 and 27-30, the Nose et al reference does not teach explicitly to include anti-reflective coatings on the pellicle. **Fukumitsu** et al in the same field of endeavor teaches a dust cover for photomask reticle wherein the dust cover comprises a thin film (1) and an anti-reflective coating (3) on the top and bottom surfaces of the thin film, (please see Figures 1 and 2). Fukumitsu et al teaches that the anti-reflective coating has a thickness of about one quarter of the design wavelength and has a refractive index that is a square root of the refractive index of the thin film (1), which is therefore different from the refractive index of the thin film, (please see column 5, lines 8-50). It would then have been obvious to one skilled in the art to apply the teachings of Fukumitsu et al to add anti-reflective coating on top and bottom of the thin film pellicle of Nose et al for the benefit of improving the transmittance and reduced the unwanted reflection of light from the pellicle.

With regard to claim 16, Nose et al teaches that the thickness of the thin film is about 0.86μm, or 860 nanometers and Nose et al teaches that the exposure wavelength is about 0.488μm or 488 nanometer, (please see Figure 7), but it does not teach explicitly that the exposure wavelength is between the 248 and 436 nm. However the specification fails to teach the criticality of having these particular wavelengths would overcome any problem in the prior art and since Nose et al teaches that by changing the thickness of the thin film the peaks of the transmission may be changed, it is therefore obvious modifications to one skilled in the art to design the pellicle thin film to have the desired peaks to facilitate different exposure

wavelengths for the benefits of utilizing it in optical systems operated with different wavelength sources as desired.

Response to Arguments

6. Applicant's arguments filed October 5, 2004 have been fully considered but they are not persuasive. The newly amended claims have been fully considered and they are rejected fro the reasons stated above.

7. Applicant's arguments are mainly drawn to the newly amended features and they have been fully addressed in the paragraphs above. The applicant is respectfully noted that US patent issued to **Hamada** et al (PN. 5,368,675) teaches explicitly about the thickness of pellicle member to give peak transmission. The interference effect for the light diffracted through medium with non-zero incident angle can be found in standard optics text book.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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